

Reliability Analysis of the Effect of Digital Literacy on Performance among Secondary School Students in Malaysia [†]

Mohd Arif Fahmi Bidin, Shamila Mohamed Shuhidan * and Noor Zaidi Sahid

Faculty of Information Management, Universiti Teknologi MARA, Puncak Perdana 40150, Selangor, Malaysia

* Correspondence: shamila@uitm.edu.my

[†] Presented at the International Academic Symposium of Social Science 2022, Kota Bharu, Malaysia, 3 July 2022.

Abstract: This paper intends to classify the factors relating to digital literacy and their effect on student performance. School teachers have been chosen in preliminary studies and support from past literature and pilot tests via survey have been carried out with 30 secondary school students. The influence of three dimensions on student performance have been studied, which include individual factors, the learning environment (physical), and socio-cultural aspects. From the pilot test, the results show that self-efficacy has the lowest value of 0.584, and the highest value is educational materials with 0.875 and is considered as one of the main factors of digital literacy.

Keywords: digital literacy; individual factors; learning factors; socio-cultural factors; student performance



Citation: Bidin, M.A.F.; Shuhidan, S.M.; Sahid, N.Z. Reliability Analysis of the Effect of Digital Literacy on Performance among Secondary School Students in Malaysia. *Proceedings* **2022**, *82*, 102. <https://doi.org/10.3390/proceedings2022082102>

Academic Editor: Mohamad Rahimi Mohamad Rosman

Published: 19 October 2022

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1. Introduction

A holistic approach to education and learning in the 21st century syndicates a distinct focus on student performance and computational thinking, which comprise of multidimensional abilities [1]. They will learn and comprehend their relationship with the world around them, utilise technology to conduct research and communicate with others, feel at ease working in teams, and acquire the strength and abilities necessary to accept leadership roles [1,2]. Digital literacy, ICT, and other contemporary technology-based abilities are crucial for the education of learners in the twenty-first century. Many current elementary and secondary school curricula have begun to include components of informatics education, training pupils to be familiar with the fundamental tools of the digital world. Other studies discuss informatics education in several nations, especially western countries and Japan. The science behind IT is variably referred to as “Computer Science” (the phrase most often used in the United States), “Computing Science,” and “Informatics”. Therefore, students in the 21st century must acquire new skills, knowledge, and ways of learning that are linked with the demands of living and working in a digital economy with a complex information environment [3]. This suggests that students should be exposed to digital literacy to help them improve their capacity to learn and to prepare them for a lifetime of learning and developing future employment skills that will push the digital economy forward [4]. The digital economy is anticipated to contribute to 18.2% of Malaysia’s GDP by 2020 (Economic Planning Unit, Office of the Prime Minister of Malaysia), and 90% of all future employment will need digital capabilities.

2. Literature Review

According to [5], in a digital learning setting, digital literacy is defined as the capacity and awareness to utilise developing digital tools to fulfil tasks while displaying the proper attitude. Meanwhile, [6] defined digital literacy as offline or online cognitive, technological, and socioemotional learning. A cognitive element includes technology selection, information search, appraisal, and selection employing critical thinking abilities, and so on. Technical abilities are an important part of digital literacy, and one of its characteristics

is the capacity to use digital learning systems. The socio-emotional dimension relates to an individual's behaviour when using digital technologies. Students nowadays are being taught to use applications and utilize the internet for academic purposes. Nonetheless, teachers often presume that the majority of students nowadays are digital natives [7], owing to their continual exposure to digital technology, such as computers, mobile phones, video games, and the internet, but not every student is a digital native and has the skills to properly utilize technology to obtain information for academic work [8]. Most students lack self-efficacy to learn something new that will help them excel academically. Few studies have been conducted to determine students' levels of self-efficacy and reading literacy [9–11]. On the other hand, the availability of pictures and graphics encourages students to explore more of a digital content site [8,12]. Students who do not have a positive correlation between their self-efficacy beliefs and their performance are regarded as poorly calibrated. Self-efficacy is vital in education, according to [13]. Students who overestimate their abilities may sometimes fail, which might reduce their drive. Students who underestimate their abilities, on the other hand, may be hesitant to make an attempt, resulting in a reduction in skill gain. According to [14], self-efficacy beliefs might also be connected to gender and culture.

Students are the fastest increasing demographic of smart phone users, with usage generally centred on internet access, based on the study by [15]. Despite their ubiquitous usage, little is known about the variables that contribute to their usage. Research has emphasised the relevance of the home environment in fostering and sustaining both safe and risky online behaviour development and emphasised the need for addressing parental usage and family behaviours on the use of technology in the home [15,16]. Parents sometimes underestimate the significant influence their child's usage of technology has on them [17]. Other than in the home environment, effective 21st century learning environments in the classroom improve the teaching–learning process [15–18]. Furthermore, the absence of, or poor quality of, infrastructure and connection in schools threatens to exacerbate students' disadvantages [16,19,20]. Infrastructure and technology utilisation in schools are both critical enablers for digital technology-based education, as well as increasing teaching and learning. Furthermore, the issue stems from a lack of teacher qualifications and a poor teaching approach in the classroom. When teachers lack digital literacy, students witness it firsthand, and this may create a divide which impedes the growth of digital culture [20–22]. Similar to the findings from [23,24] which demonstrated a positive correlation between digital literacy and student performance, the results of the current research are compatible with the findings of [25–27].

3. Development of Research Framework

Preliminary studies found that the students who took computer science lacked information on the topic and had mediocre digital literacy abilities. This is due to the self-efficacy of the student itself doing programming exercise and practice. The school has inadequate facilities for conducting lessons, and the instructors need to be updated. In Malaysia, there is limited information and literature pertaining to the implementation of digital literacy (DL) in school, even though they already exercised the computer science subject. On the study method in the literature framework, a few of the components of the frameworks were analysed with regards to the relevant subject of this research. The proposed theoretical framework is shown in Figure 1.

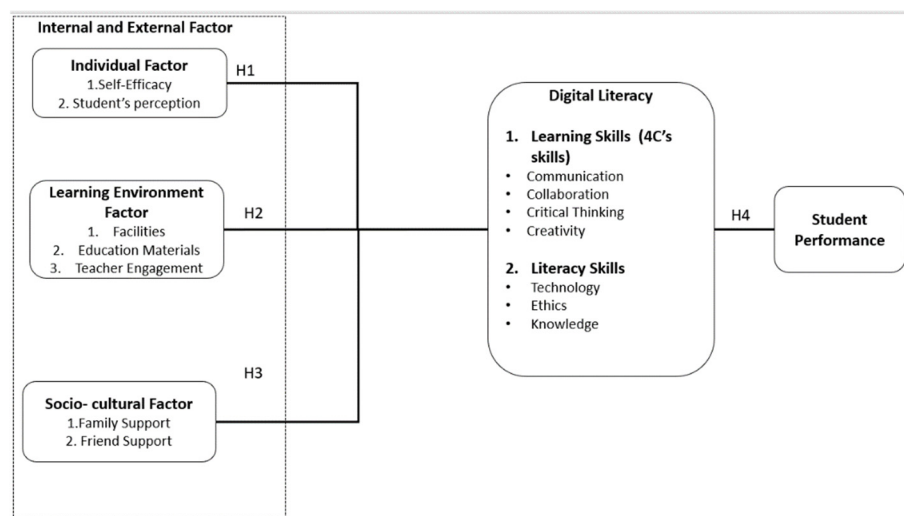


Figure 1. Research Framework.

In the 21st century, students must be highly competent and technologically literate learners [1,2,27]. They must be adaptable and receptive to new ideas and circumstances [27,28]. This should include the capacity to appreciate the underlying nature of technology phenomena and the ethical and societal consequences of using online technologies and information. These concerns are accompanied by digital literacy characteristics that demonstrate their effects on the link between 21st-century learning rudiments and student performance and their incorporation into this relationship. Students must possess the four C's: critical thinking, creativity, cooperation, and communication skills, in order to succeed in school. Digital literacy enhances engagement and participation processes and enables pupils to become active as opposed to passive in interpersonal circumstances [29]. From the Figure 1, there are three independent variables found which are Individual fact, Learning Environment Factor and Socio-cultural factor that have significant relationship with digital literacy. Furthermore, this study also extends to measure on the effect of digital literacy towards student performance. Generally, there are four hypotheses have been observed in this study. Therefore, the hypothesis for this study is as in Table 1:

Table 1. Hypothesis Statement.

Hypothesis	
H1	Individual factor has a significant relationship towards digital literacy.
H2	Learning environment has a significant relationship towards digital literacy
H3	Socio-cultural factor has a significant relationship towards digital literacy.
H4	Digital literacy has a significant relationship with student performance.

4. Pre-Testing, Validity, and Reliability of Research Instrument

The pre-tested and pilot test provided a meaningful finding that helped the researcher to identify the appropriate variables for further exploration. Thus, the result of this preliminary study supports the rationality and dependability of the study. Preliminary research was directed to confirm the usefulness of the initial questionnaire to draw the information and items needed. To this effect, two schoolteachers were found eligible to be interviewed and granted permission from their school. Two computer science teachers were chosen as they are the ones who are actively involved with digital literacy programs and initiatives within school environments. According to [30], digital literacy should be part of the teaching plan for every subject. However, due to the COVID-19 outbreak, the researcher did not manage to conduct personal visits to the respective teachers and school. Structured interviews were conducted online and via calls. The aims of these interviews were to gather

as much as possible on the experience and reality of their personal involvement in digital literacy in school. The topics covered in these interviews focused on the management support from school committees, including students, teachers, parents, and management. Various aspects of teaching and learning within the individual factor, environment factor, and socio-cultural factor have also been discussed with the teachers.

In developing the survey questionnaire, five professionals were chosen to review the instrument. The survey was verified by two senior lecturers at the Faculty of Education from Public Universities. These academicians are highly experienced and qualified in the field of education, digital literacy, and research methodologies for social sciences. Besides, three teachers from secondary schools were also selected for this expert reviews. These teachers were selected as they are the ones who engage actively with education, students' digital literacy, and the environment of education in Malaysia. In order to approach the evaluators, a formal letter endorsed by the Faculty of Information Management was sent to seek permission to conduct the questionnaire pre-testing. Once the permission was granted via email, the researcher made a follow-up call and arranged the date to see the respective experts. The researcher sent the questionnaire and pre-testing checklist via email before meeting them for face-to-face interviews. One week to two weeks were given for the evaluators to read and understand the content of the questionnaire. A few concerns were highlighted especially regarding the usage of some jargon and terms to match with the understanding of the school students' level. All of these reviews were highly useful in helping the researchers finalize the questionnaire set with the appropriate modifications.

The survey questions are classified into seven sections with closed-ended types and open-ended types of questions. The structure of the survey questionnaire began with Section 1 concerning demographic content, consisting of 11 questions. The classification of the data will be easier, since the information from all of the respondents can be categorized based on gender, age, type of school, and ICT skills. In Sections 2–6, the questionnaire consisting of 45 questions focused on the independent variables and dependent variables of the study. All sections use the five Likert scale ranging from "strongly agree" (coded 5) to "strongly disagree" (coded 1). Additionally, two open-ended questions were added in which allowed respondents to respond subjectively.

A survey method is used to collect data from a predefined group of respondents to gain information and insights into various topics of interest. In this study, the data will be collected from secondary school students through a personally administered structured questionnaire. The respondents will consist of the students from Klang Valley. All of the participants are students from form one, two, and four. The schools chosen for this research are based on the Smart School Qualification Standard (SSQS) 2018 with rankings of four stars and above. The main advantage of this technique is time management, since the respondents only spend around 10 min answering the questions, compared to the interview session. In this survey, only one method of survey will be conducted, which is a written survey.

5. Reliability Analysis Result

As revealed in Table 2, Cronbach's alpha coefficients determine the reliability and internal consistency of the scales exercised in the study. All factors had Cronbach's alpha values greater than 0.6, suggesting that the reliability level is appropriate and acceptable, except for in the dimension of self-efficacy where the value of Cronbach's alpha are below 0.6, which is unsatisfactory. According to the SPSS analysis results, the overall consistency, or Cronbach's alpha values, of all 56 items for each dimension contained in the instrument was between 0.584 and 0.875. Educational materials and tools show the highest value of 0.875, while self-efficacy shows the lowest value of 0.584; this means that there is room for refining the instruments in this study. One factor that might impact the value of Cronbach's alpha is the fact that the pilot test was conducted during the COVID-19 outbreak and the students had to attend online classes instead of normal classroom teaching and learning. It is also suggested that assessing students' self-efficacy could be advantageous for teachers to

design appropriate teaching approaches during the COVID-19 crisis, as is reported by [31]. According to [32,33], a value of Cronbach’s alpha of less than 0.6 will affect the validity of the data. Two possibilities happen in this scenario: either the number of items in the self-efficacy dimension are not enough or the items are partly correlated with each other, or there is diversity in the construction of the instrument. Therefore, the items need to be revised or removed. One of the approaches used in refining the value of Cronbach’s alpha is adding more related items to test the same concept. This result implies that, particularly at this point in the investigation, the overall index of the scale’s internal consistency within the instrument is reliable with no unexpected abnormalities found in the data. The pilot test has been carried out with 30 students and the result of the pilot test is summarised in Table 2.

Table 2. Cronbach’s Alpha Analysis Result.

Variables		Number of Items	Cronbach’s Alpha
Individual factor	Self-efficacy	5	0.584
	Student’s perception	5	0.664
Learning environment factor	Facilities	5	0.706
	Educational materials	5	0.875
	Teacher engagement	5	0.748
Socio-cultural factor	Family support	5	0.819
	Friend support	5	0.848
Digital literacy		5	0.873
Student performance		5	0.765
Overall		45	0.946

6. Discussion and Conclusions

The resolution of this article is to present the summary of an ongoing research project on the effect of digital literacy in school on student performance. Literature reviews and preliminary studies have been conducted with computer science teachers in secondary school and found that three dimensions, namely individual/personal factors, learning environment influences, and socio-cultural aspects of digital literacy, impact student performance. Preceding the actual research, the instrument underwent pre-testing with three subject-matter experts to ensure the reliability of each question and understandability of the items. A pilot study was also carried out and was participated in by 30 respondents among secondary school students in Klang Valley. The analysis results of the collected data suggest that the overall index of the scale’s internal consistency within the instrument is reliable, as stated in this paper. Consequently, it is essential to conduct research on digital literacy, particularly on the relationship of the individual factor, learning environment factor, socio-cultural factor on digital literacy, and the correlation between digital literacy towards student performance. According to studies, digital literacy shows a significant relationship to the individual factor, learning environment factor, socio-cultural factor. Besides, digital literacy also made a major contribution towards student performance. Therefore, this study was able to provide some empirical evidence on the subject. Extensive research methods and systematic analysis were used to verify the empirical evidence in this study. Instrument development for this study was guided by the results of instrument validation and hypothesis testing. The instrument needs to be validated in order for the results to be accepted and published in a reputable journal and presented at academic conferences. Despite the fact that secondary school students were the primary focus of this study, the instrument can be used for any level in other types of industries. Furthermore, the questionnaire items can be used or adapted in a separate study to identify the specific factors involved in the selected dimensions. This is due to the fact that the developed

instrument may reduce the potential problems associated with the individual factor, learning environment factor, and socio-cultural factors and digital literacy. The findings of this study can be used to improve students' performance in terms of academic performance. The findings provide a small amount of support for policymakers and practitioners, particularly the Ministry of Education and school administrators to reconsider their policies development frameworks and align our education structure of the Malaysia Education Blueprint for 2013–2025 with the digital literacy set skills to meet future job demands. In practice, this research aids principals and school administrators to develop an improved thoughtfulness for digital literacy and its importance in 21st century learning. With the findings from this study, school administrators were able to see the level of digital literacy for each construct. From there, it can be improved by conducting related programs and activities. Given the potential influence of the individual factor, learning environment factor, and socio-cultural factor, schools must develop policies that allow for the integration of digital literacy aspects in the classroom. Digital literacy is crucial in the 21st century learning method. This implementation and these resources can help to boost digital literacy in school and improve the existing curriculum standards. This will also be able to increase students' interest in learning. Through the existence of this policy, various innovative ideas can be developed. Following that, school will become the centre of innovation and digital literacy in society. Furthermore, technological tools can aid in the learning process.

Author Contributions: Conceptualization, M.A.F.B. and S.M.S.; methodology, M.A.F.B. and S.M.S.; software, M.A.F.B. and S.M.S.; validation, S.M.S.; formal analysis, S.M.S.; investigation, M.A.F.B.; resources, M.A.F.B.; data curation, M.A.F.B. and S.M.S.; writing—original draft preparation, M.A.F.B.; writing—review and editing, S.M.S.; visualization, M.A.F.B.; supervision, S.M.S.; project administration, M.A.F.B., S.M.S. and N.Z.S. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Acknowledgments: The researchers would like to extend their gratitude to Universiti Teknologi MARA (UiTM)—Faculty of Information Management Puncak Perdana for providing the necessary funding for publication. The researchers also would like to thank schools, teachers, and respondents who provided feedback and participated in this study.

Conflicts of Interest: The authors declare no conflict of interest.

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